

DStockton

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Price measurement for monetary policy

Over the past year, Committee members have raised a number of questions about the conduct of monetary policy in a low-inflation environment. In a paper circulated recently to the FOMC, my colleagues David Lebow, Deb Lindner, Dan Sichel, and Bob Tetlow focused in depth on issues surrounding the choice of a price measure to guide monetary policy and on defining zero inflation in terms of the available published price indexes.

We organized our project around four basic questions: First, what does economic theory suggest is the measure of prices most appropriate for judging the performance of monetary policy? Second, what are the statistical relationships among the major price indexes that we monitor? Third, what are the measurement errors in these indexes and what rate of change in these measures would correspond roughly to zero inflation? And finally, what would be the consequences for the stability of real output and interest rates, of focusing monetary policy on various measures of price inflation ?

Let me start with the guidance provided by economic theory. Unfortunately, theory does not point unambiguously to a specific price index to guide monetary policy. In principle, to answer the question coherently requires a complete model of the economy that incorporates all of the costs of inflation. Using such a model, one could trace monetary policy actions through to their effects on different price measures and then define a price objective to minimize the costs of inflation and inflation uncertainty. The problem is that no such comprehensive model exists. As a consequence, our analysis--like the literature--is somewhat compartmentalized and thus not entirely satisfying. That said, the authors note some useful observations.

One observation is that some costs of inflation point toward the desirability of stabilizing a broad measure of prices, with the choice determined by one's judgment about how inflation distortions are related to movements in various measures of aggregate prices. Households, businesses, and governments all participate in transactions that could be distorted by inflation, impairing efficiency and ultimately reducing society's consumption possibilities. Under these circumstances, stabilizing a broad collection of prices, such as the GDP price measure, might be appropriate. If one viewed household decisions, particularly those related to long-term saving and investment, as most susceptible to errors associated with inflation, greater weight might be placed on stabilizing a consumption price measure, such as PCE prices. But, we see little justification for considering, as a long-run objective, any narrower measure of prices.

A second observation is that the measure of prices implicitly embedded in nominal interest rates might be the appropriate objective of policy, especially if one were concerned about minimizing tax distortions and limiting the effect of the inflation risk premium on the cost of capital. What is this measure? We don't know. It would seem likely that interest rates are determined by the interaction of borrowers and lenders who must be considering a very broad range of prices in making their decisions. This is an issue that deserves some careful empirical attention.

Finally, we noted that there are some arguments in favor of including assets in the price index to guide monetary policy. Frankly, we didn't make much progress evaluating these arguments. And, in the end, we largely punted on the issue for three pretty good reasons: no theory, no data, and no empirical models. With respect to the theory, there is

surprisingly little work that addresses this issue. On the data side, constructing an index that included a reasonably comprehensive coverage of asset prices would be a monumental undertaking. Finally, targeting such an index, even if it were available, would be such a radical departure from your past behavior, econometric models estimated on historical data would not provide much guidance for policymaking. I'm afraid that this is an issue that remains on the research agenda.

In the second section of the paper, the authors address the question of whether, in practice, the choice of an inflation measure matters. If all the major measures move closely together over time, the choice of which index to focus on will not be very consequential. We employed a battery of statistical tests to determine whether most broad measures of inflation move together over long periods or drift apart; in the jargon of econometricians, we tested whether measures of inflation are cointegrated. We concluded that the most broad measures are cointegrated; that is, PCE, GDP, and CPI inflation do not drift apart over long periods of time.

However, that does not mean that these measures will always be giving the same signal about inflation. The paper presents spreads between the four-quarter changes of the major indexes. Over the past ten years, the GDP chain-weighted price index has increased, on average, about 0.3 percentage point per year less than the PCE price measure, and 0.5 percentage point per year less than the CPI. But year by year, these differences fluctuate considerably and can give conflicting signals about the magnitude and direction of inflation movements. For example, PCE inflation has run about 0.2 percentage point less per year than CPI inflation over the past ten years. But for a time last year, PCE prices were rising $\frac{3}{4}$

percentage point less than the CPI, largely reflecting a smaller measured increase in medical care costs, which also receive a bigger weight in PCE prices. Given their different construction and data sources, it's not surprising that different indexes will, at times, provide conflicting signals about the movement of inflation.

In the third section of the paper, the authors review our current thinking about measurement bias in the CPI, and extend that analysis to GDP and PCE prices. Clearly, in assessing the performance of inflation relative to the objective of zero inflation, it is necessary to take account of the measurement bias in the relevant price indexes. As we have noted previously, our current best estimate of the annual bias in the CPI is about 1 percentage point. By 1999, we estimate that the bias will be about 0.8 percentage point per year. The smaller estimated bias largely reflects our assumption that BLS will implement geometric weighting for some item strata in the CPI next year, further reducing low-level substitution bias.

Because PCE prices, to a large extent, use CPI components in their construction, this index is subject to most of the same sources of measurement bias. The principal exception is that chain-weighting of the PCE price measure avoids the upper-level substitution bias that plagues the fixed-weighted CPI. We estimate that the overall bias in the PCE chain price index will be 0.6 percent per year in 1999--two-tenths less than the CPI. A little more guess work was involved in deriving a measure of the bias in the GDP price index. But using the available research and a dose of judgment, we estimate a bias of 0.7 percent per year.

There isn't much evidence on whether these biases might have changed over time. It's possible that the rapid pace of technical change that we perceive in recent years has led to an

intensification of measurement problems. But, the Stigler Commission established to study the CPI in the early 1960s reported with similar intensity many of the same quality adjustment and new goods bias problems that we discuss today.

In the final section of the paper, we explored how stabilization of various inflation measures might affect the behavior of real output and interest rates. Because certain price indexes are more sensitive to certain types of shocks, stabilizing different price measures could have different consequences for the variability of real output and interest rates. For example, because we consume more petroleum products than we produce, fluctuations in oil prices have larger effects on PCE prices than GDP prices. Consequently, if these were the chief source of inflation disturbances, limiting fluctuations in PCE prices could result in larger fluctuations in real output than would a similar stabilization of GDP prices. Of course, the opposite could be true as well; domestic productivity shocks would have larger effects on production prices than consumption prices.

In the event, stochastic simulations of the staff's econometric model using shocks that have typified the past thirty years suggested macroeconomic performance would not be much affected by the inflation measure that is stabilized. Stabilizing either PCE or GDP price inflation results in about equal volatility of real output around potential. Roughly the same result held when we used shocks drawn from the events of the past ten years--PCE and GDP prices perform about equally well.

Finally, we compared targeting PCE prices to targeting core PCE prices. We found that we could achieve lower combinations of inflation and output variability when policy responded to the total PCE inflation measure rather than just the core measure. Within the

context of our model, this result occurs because food and energy shocks have effects that feed back onto real output and inflation. If policymakers ignore the potential propagation of these shocks when they occur, they will have to push harder on real output later on to reverse these effects.

Two caveats are in order with respect to this finding. First, the result may be specific to our model. For example, if households and businesses largely ignore the effects of food and energy shocks in forming inflation expectations, the adverse feedbacks that are incorporated in our model might be smaller in reality. The second caveat is that policymakers may be able to sort out permanent from transitory shocks. Obviously, if we were confident in our abilities to make accurately that distinction, you could respond to the permanent shocks and largely ignore the temporary shocks. Nevertheless, the model results are useful in pointing out the danger of focusing on too narrow a price measure in making policy.

In conclusion, I think the authors covered a great deal of useful ground and made substantial progress in clarifying some of the issues that confront monetary policy in a low-inflation environment. However, we recognize that we still have a long way to go and that there are some significant gaps in our knowledge. In that regard, I should note that considerable work--both theoretical and empirical--is under way around the System to address the policy issues growing out of the U.S. economy's approach to price stability.